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Master Arbeit
TITLE

Author(s): AUTHOR ETH-Nr. 12-345-678

Supervisor: PROFESSOR SUPERVISOR

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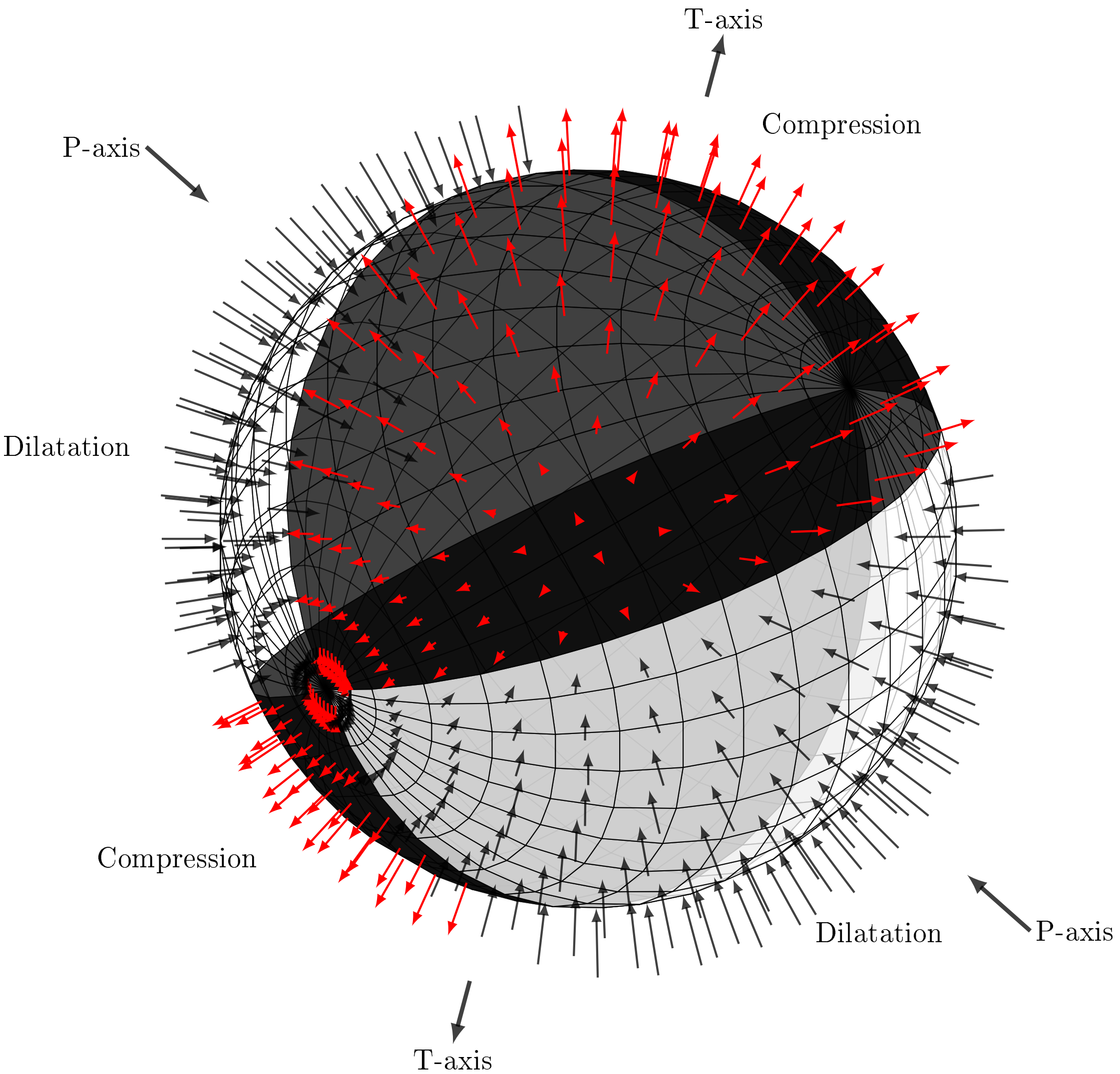

Seismic focal mechanism and Pression-Tension axis.

Institut für Bau- und Infrastrukturmanagement
Professur für Infrastrukturmanagement

D BAUG

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

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Abstract

look at

The abstract is a concise and accurate summary of the research described in the document. It states the problem, the methods of investigation, and the general conclusions, and should not contain tables, graphs, complex equations, or illustrations. There is a single abstract for the entire work, and it must not exceed 350 words in length.

The abstract should be given in both English and German language, independent of the language in which the thesis itself is written.

Acknowledgment

Acknowledgments are the author's statement of gratitude to and recognition of the people and institutions that helped the author's research and writing.

For example, the supervisor, other academic and/or technical staff at the university, experts in other institutions who may have provided advice or access to information, funding bodies, colleges, friends and family.

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1 Introduction

1.1 Some formal aspects

Strong demands can only be met with the help of a very stringent and clear structure laid out at the beginning of the writing process. One of the most clear structuring is given by a rigorous "legal numbering"(1, 1.1, 1.1.1 etc.). It is good to know that LaTeXdoes all this formatting business without any need to renumber things yourself at each iteration and so on. Thus we strongly recommend using LaTeXfor the project. Anything else (e.g. Word) is a mess when writing an elaborate scientific text with many graphics and formulas.

Even a particular elusive reader should be able to quickly glean the most important thoughts, experiments and results from just looking at illustrative schematics, diagrams, and pictures with self explaining, extensive figure captions.

There are always parts/chapters/sections of text which are complex and important for a full description and documentation of the work, but not absolutely necessary for following the main lines of thought. It is very helpful for the somewhat more interested, but temporally limited reader if such passages of text are correspondingly marked, e.g. by a brief introductory remark to such sections, or even by moving them into appendices.

Definitively each chapter and ideally also each section should begin with a short guide: what is communicated in the following text, which sources (quote clearly) have been used, what are the basic concepts used and which goals are to be reached. Similarly, at the end of larger elaborations a short synopsis of the communicated content should be offered.

1.1.1 Plain text

A single font must be used throughout the thesis or report, the only exceptions being in tables, graphs, and appendices. Headings may be bolded and no more than 2 points larger than the rest of the text.

The page format should be single column with one and a single spacing used between the lines. Spacing of words on a line should be such that the line can be easily read. Crowding words together or leaving excessive spaces is not permitted.

1.1.2 Footnotes

For those who are using footnotes[1], Arabic numerals are used consecutively throughout a chapter, and should normally appear at the bottom of the relevant page, keyed to the same number following the word or phrase in the text to which it refers. If a footnote is too long for the relevant page, it may be continued on the following page preceding the footnotes for that page. If the number of footnotes is very large, numbers may be restarted with each chapter.

1.1.3 Lists

There are three types of lists with the environment names *itemize*, *enumerate* and *description*. All lists have a separation between each item, to improve the reading of item texts spanning several lines. This item text can contain multiple paragraphs. These paragraphs are appropriately spaced and indented according to their position in the list.

- The *itemize* sets off list items with *bullets*, like this.
- Of course, lists can be nested, each type up to at least four levels. One type of list can be nested within another type.
  - Nested lists of the same type will change style of numbering or *bullets* as needed.

1. The *enumerate* environment numbers the list elements.

   This is a new paragraph in the item text, which is not intended as in the normal text but separated from the previous paragraph.

2. The enumeration scheme changes with each nesting level
   a) as shown in this nested enumerated list item.

Some description The *description* environment allows to describe some content.

1.1.4 Mathematical symbols and equations

Each formula, except for generally accepted and well-known formulas, either has to be mathematically derived, to be explained, or a literature source has to be provided. This applies especially to complex models, where each constraint should be described and explained.

There are three types of mathematical equations: (a) in-line equations, (b) displayed butunnumbered equations, and (c) displayed and numbered equations.

[1] Some example footnote.

In-line equations

An in-line equation is used for particularly simple relationships which (i) do not need vertical space for integrals, fractions, etc., (ii) can be expressed without breaking the flow of the sentence, and (iii) will not be referenced again in the document.

For example:

> If volume V and temperature T are known, the ideal gas law can be used to get a reasonable approximation for the pressure of a gas as $P = nRT/V$, where n is the number of moles of gas and R is the gas constant.

Unless all the variables have been defined earlier in the document, the physical significance of all the quantitie s appearing in an equation must be stated at the point of their first appearance in the document.

Displayed, but unnumbered, equations

Equations that are too complex to be written as in-line equations should be "displayed", which usually means, that the equation is centered between the left and right margins or aligned at a tab stop with some indent from the left margin and some vertical space is provided above and below the equation to set it apart from the text.

For example:

> The van der Waals equation is used to provide a more accurate expression for the pressure P as a function of the molar volume V_m and the temperature T as
>
> $$P = \frac{RT}{V_m - b} - \frac{a}{V_m^2} ,$$
>
> where a and b are van der Waals parameters for the gas.
>
> or
>
> The electric field $\mathbf{E}$ at the origin due to a point charge q at a distance r is given by
>
> $$\mathbf{E} = \frac{|q|}{4\pi\varepsilon_0 r^2}\hat{\mathbf{r}}$$
>
> where $\hat{\mathbf{r}}$ is the position vector of the point charge.

Note that in the examples presented above, the displayed equation is part of the text, i.e, it is punctuated, and incorporated in to the structure of the sentence.

All the scalar variables are italicized whereas the vector quantities in the second example are Roman boldfaced.

Displayed and numbered equations

One often has to refer back to the important equations. The standard way to do this is by referring to the equation number. Of course, in order to refer to an equation number, one must first number the equations. A consiste nt system of numberi ng equations must be adopted. Various options are:

- Number equations as (1), (2), etc., starting in Chapter 1 (or at the first numbered equation) and continuing until the end of the last numbered equation in the document.
- Incorporate the chapter number into the equation, as in (1.1), (2.3), (4.6), etc., which means the equation numbering goes back to 1 at the beginning of each chapter.
- Use Roman numerals for chapter numbers, as in (I.1), (II.3), (IV.6) etc.

For example:

> The non-relativistic Schrödinger equation for a particle of mass m subject to a potential energy function V(x) in a one-dimensional universe is
>
> $$E\psi(x) = \frac{-\hbar^2}{2m}\frac{d^2\psi}{dx^2} + V(x)\psi(x) \tag{1.1}$$
>
> where $\hbar = h/(2\pi)$, h is Plack's constant, and E is the total energy of the system.

The equation in the example is approximately centered on the page, and the equation number is aligned by a right-tab at the right margin.

To cite an equation in text, use an abbreviation if it is not the first word of the sentence. Suitable singular and plural ab breviations include eq. and eqs., Eq. and Eqs. Spell out "Equation" when it is the first word of a sentence and when it is not accompanied by a number.

The used numbering of the equation may change according to the context of the work. E.g. number them as subequations

$$\dot{q}_i = \frac{\partial H}{\partial p_i} \tag{1.2a}$$

$$\dot{p}_i = -\frac{\partial H}{\partial q_i} \tag{1.2b}$$

or with only a single number

$$\begin{aligned} \dot{q}_i &= \frac{\partial H}{\partial p_i} \\ \dot{p}_i &= -\frac{\partial H}{\partial q_i} \end{aligned} \tag{1.3}$$

Many further possibilities of displaying equations exist.

1.1.5 Tables

Tables should only be used to present three (3) or more items; otherwise, the data should be described in the narrative. Tables should be arranged so like material appears in columns, not rows. Information presented in tables should be sufficiently understandable so frequent reference to the narrative is unnecessary. Each table should have a title, generally appearing above the table itself. The table title and other items may be footnoted, although extensive explanations appearing in footnotes should be avoided. All abbreviations and symbols should be defined.

Tables are generally no more than what can be printed on one page, but occasionally multi-paged tables are necessary and are acceptable. Tables may appear on pages which contain narrative text or tables may appear singularly on a page (i.e. one table per page and only the table on the page).

Tabelle 1.1: Comparison of the mean-field predictions for the critical temperature of the Ising model with exact results and the best known estimates for different spatial dimensions d and lattice symmetries.

lattice	d	q	T_{mf}/T_c
square	2	4	1.763
triangular	2	6	1.648
diamond	3	4	1.479
simple cubic	3	6	1.330
bcc	3	8	1.260
fcc	3	12	1.225

1.1.6 Figures

Figures present charts, graphs, or images to the reader. Figure legends should be sufficiently detailed to allow the reader to understand without frequent reference to the narrative. However, overly detailed descriptions should be avoided. All abbreviations and symbols should be defined. Figure legends should appear on the same page and in the same orientation as the figure. For example, if the figure appears in landscape mode then the legend should also appear in landscape mode. If the figure legend is too lengthy to appear on the same page as the figure, then the legend, in its entirety, must appear on the next page.

Similar to tables, figures are usually constructed to be no more than what can appear on one page, but occasionally multi-paged figures are necessary. Figures may also appear singularly on pages or on pages containing narrative text.

All possibilities of grouping pictures side by side, on top or in matrices can be realized. Each subfigure is created in the same way as a graphic inside a figure, just enclosed by a figure environment, as shown in Figure 1.2.

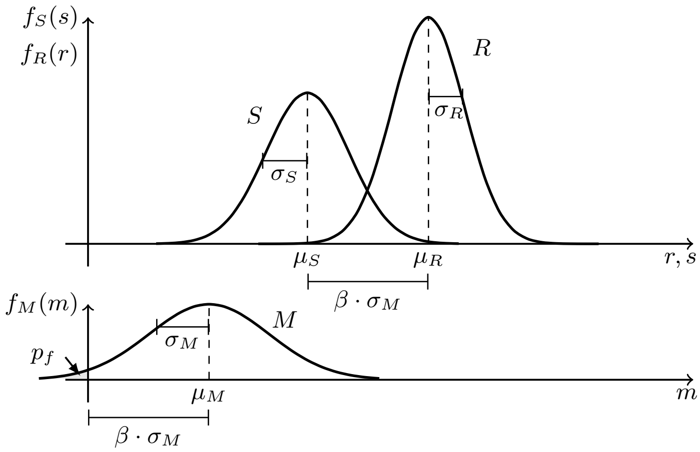
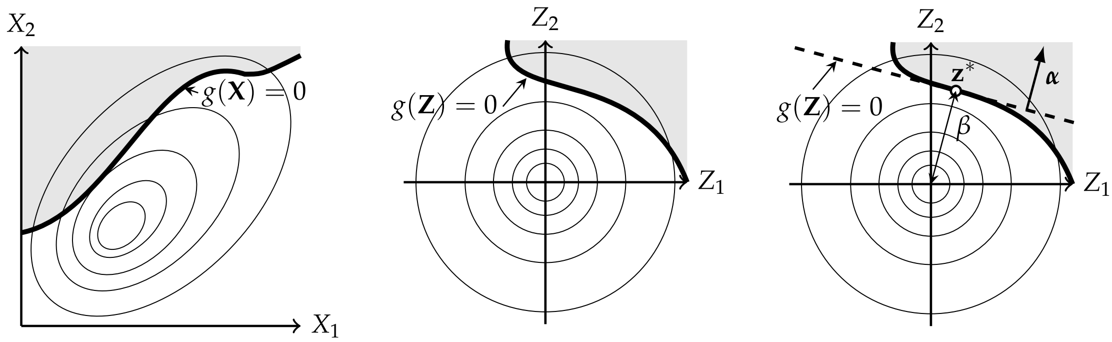


Abbildung 1.1: Safety Margin an Reliability Index. Are the random variables R and S normally distributed also the safety margin M is a normal random variable. In standardised domain the reliability index β provides the information how often σ_M has space between the origin and μ_M.



$$p_f = \int \cdots \int_{g(\mathbf{X}) \leq 0} f_{\mathbf{X}}(\mathbf{x}) d\mathbf{x}$$

(a)

$$p_f = \int \cdots \int_{g(\mathbf{Z}) \leq 0} \phi_{\mathbf{Z}}(\mathbf{z}) d\mathbf{z}$$

(b)

$$p_f = \Phi(-\beta)$$

(c)

Abbildung 1.2: First Order Reliability Method. (a) Representation of a physical space with a set $\mathbf{X}$ of any two random variables. The shaded area denotes the failure domain and $g(\mathbf{X}) = 0$ the failure surface. (b) After transformation in the normalized space, the random variables $\mathbf{Z}$ are now uncorrelated and standardized normally distributed, also the failure surface is transformed into $g(\mathbf{X}) = 0$. (c) FORM corresponds to a linearization of the failure surface $g(\mathbf{X}) = 0$. Performing this method, the design point $\mathbf{z}^*$ and the reliability index β can be computed.

1.1.7 Citations

Academic work almost always builds upon the work of others, and it is appropriate, indeed essential, that you discuss the related and previous work of others in your thesis. However, this must be done according to the rules of acceptable use.

Much of the advice in the section on books will pertain to other sources as well. Their long history as a formal publication ensures, in particular, that the variations in author names and titles will serve as a model for constructing documentary notes and bibliography entries for many other types of sources.

The Chicago Manual of Style[2], implemented here in its 16th edition, has long, been one of the most influential style guides for writers and publishers. While one's choices are now perhaps more extensive than ever, the Manual at least still provides a widely-recognized, and widely-utilized, standard.

A full reference must include enough information to enable an interested reader to locate the book. Most references contain at least some information not strictly needed for that purpose but potentially helpful nonetheless. The elements listed below are included, where applicable, in full documentary notes and bibliography entries.

The author appears as part of the narrative:

> **?**, p.100 show how to calculate the reliability index β, by using geometric properties.

Otherwise, in parentheses:

> A near linear relationship can be obtained between ultimate flexural and shear capacity of a RC section, if pitting corrosion occurs (**?**).

[2] **?**

2 Zielformulierung

Das Ziel dieser Untersuchung ist es den Gesamtnutzen zu maximieren. Dies wird erreicht in dem die Kosten minimiert werden.

Dies hier ist ein Blindtext zum Testen von Textausgaben. Wer diesen Text liest, ist selbst schuld. Der Text gibt lediglich den Grauwert der Schrift an. Ist das wirklich so? Ist es gleichgültig, ob ich schreibe: „Dies ist ein Blindtext“ oder „Huardest gefburn“? Kjift – mitnichten! Ein Blindtext bietet mir wichtige Informationen. An ihm messe ich die Lesbarkeit einer Schrift, ihre Anmutung, wie harmonisch die Figuren zueinander stehen und prüfe, wie breit oder schmal sie läuft. Ein Blindtext sollte möglichst viele verschiedene Buchstaben enthalten und in der Originalsprache gesetzt sein. Er muss keinen Sinn ergeben, sollte aber lesbar sein. Fremdsprachige Texte wie „Lorem ipsum“ dienen nicht dem eigentlichen Zweck, da sie eine falsche Anmutung vermitteln.

3 Infrastruktur Objekt

Was ist die Deep Theroy?

Das von mir ausgewählte Infrastrukturobjekt ist eine *Veloschnellstrassenverbindung* zwischen Uster Bahnhof Nord und der Sportanlage Buchholz.

+ der Inhalt ist kake

Dies hier ist ein Blindtext zum Testen von Textausgaben. Wer diesen Text liest, ist selbst schuld. Der Text gibt lediglich den Grauwert der Schrift an. Ist das wirklich so? Ist es gleichgültig, ob ich schreibe: „Dies ist ein Blindtext“ oder „Huardest gefburn“? Kjift – mitnichten! Ein Blindtext bietet mir wichtige Informationen. An ihm messe ich die Lesbarkeit einer Schrift, ihre Anmutung, wie harmonisch die Figuren zueinander stehen und prüfe, wie breit oder schmal sie läuft. Ein Blindtext sollte möglichst viele verschiedene Buchstaben enthalten und in der Originalsprache gesetzt sein. Er muss keinen Sinn ergeben, sollte aber lesbar sein. Fremdsprachige Texte wie „Lorem ipsum“ dienen nicht dem eigentlichen Zweck, da sie eine falsche Anmutung vermitteln.

Was für ein Müll

4 Objective funtion and Steakholder

Was ist ein Label?
Wie kann ich das ändern?

Das stinkt :=)

4.1 Einleitung

Das Ziel der von mir untersuchten Infrastruktur Investitionen ist es den Gesamtnutzen der Interessensverbände zu maximieren.
Dies mit speziellem Augenmerk auf der Vermehrung des Nutzens der Nutzer dieser Infrastruktur, d.h. der Fahhradfahrer.
Die Nutzen die durch die Anwendung einer Infrastruktur Intervention entstehen sind hier definiert als die Verminderung der Kosten.
Die von mir verwendete Grundlage für die Erstellung dieser Auflistung der Steakholder sowie der Nutzen der jeweiligen Interessensverbände, basiert auf dem Dokument:

Structure and Infrastructure Engineering: IM1-HS2019-HO-Adey-et-al-2012-f.pdf

Ich möchte den Nutzen also die Reduktion der Kosten gemäss der Funktionen in diesem Dokument berechnen. Die Variablen dieser Funktionen werden ich anhand der Angaben aus dem *STEK* sowie der von mir definierten Unsicherheiten modellieren.

Die von mir untersuchten Infrastruktur Investitionen werden sich hinsichtlich ihrer Kapazitäten unterscheiden und ich möchte untersuchen welche Variante die optimale Vermehrung des Gesamtnutzens ermöglicht.
Ist es möglich die Nachfragebeziehungen für das Fahrrad, zwischen dem Bahnhof Uster und der Sportanlage Buchholz mit Hilfe des GIS-Browsers zu modellieren bzw. für die Zukunft zu schätzen?

So wäre eine meiner unsicheren Rahmenbedingungen die Anzahl Fahrräder die in Zukunft, (ca. 30-40 Jahre), pro Tag die Strecke Uster Bahnhof - Sportanlage Buchholz befahren.

4.2 Steakholder

Die Tabelle 4.1 listet die Interessensgruppen sowie die Kostenstrukturen auf.

Die Gleichung (1) beschreibt den Totalen Nutzen TN einer Interventionsstrategie I. Der Totale Nutzen ist definiert als der netto Nutzen aller Steakholder über einen untersuchten Zeitraum [0,T]
Wobei Nutzen hier definiert ist als die Diffenrenz der Kosten vor und nach dem Durchführen einer Intervention.

$$TN_i = \int_0^T (N_U^i(t)+N_{TT,Velo}^i(t)+N_{B,Velo}^i(t)+N_{A,Velo}^i(t)+N_{D,Velo}^i(t)+N_E^i(t)+N_{K,\ddot{O}V}^i(t))\cdot e^{-\gamma t}dt \tag{4.1}$$

Die Zeit 0 kennzeichnet den Startpunkt der Untersuchung wobei die Zeit T das Ende der Untersuchungsperiode ist. γ ist der Diskontsatz.

Interessensgruppen	Art der Nutzen	Symbol	Beschreibung
Besitzer der Infrastruktur	Reduktion der Unterhaltskosten (U)	$N_U^i(t)$	Menge an Arbeitsstunden Menge an Arbeitsmaterial
Nutzer	Reduktion der Reisezeitkosten (TT)	$N_{TT,Velo}^i(t)$	Kosten der Reise in Anbetracht des Zeitverlust. Verlust von Arbeitszeit und Freizeit.
	Reduktion der Fahrzeugbetriebskosten (B)	$N_{B,Velo}^i(t)$	Arbeitsstunden für Instandhaltung. Materialmenge für Instandhaltung.
	Reduktion der Unfallkosten (A)	$N_{A,Velo}^i(t)$	Anzahl Materialschäden Anzahl und Art von Personenschäden Anzahl Todefälle
	Reduktion der Kosten durch Unbehagen (Discomfort) (D)	$N_{D,Velo}^i(t)$	Menge der Kosten durch Veränderung des Komforts. Physisch durch holprige Strassen und psychologisch aufgrund erhöhter Gefahrenlage
Öffentliche Hand	Reduktion der Umweltbelastung (Environment) (E)	$N_E^i(t)$	Menge an Lärmbelastung Mänge an Luftverschmutzung *Durch Verminderung des MIV-Anteil*
	Erhöhung der Fahrkomforts ÖV (K)	$N_{K,ÖV}^i(t)$	Reduktion der Anzahl Passagiere im Bus in der Rushhour

Tabelle 4.1: Tabelle der Interessengruppen und Kostenstrukturen

4.3 Zielfunktion

Das Ziel meiner Optimierung ist es den Gesamtnutzen zu steigern mit speziellem Augenmerk auf der Vermehrung des Nutzens der Fahrradfahrer.
Die geplanten Infrastruktur Interventionen sollen die Kapazität und somit das Angebot auf der Route Bahnhof - Sportanlage erhöhen.
Mithilfe der Optimierung und der anschliessenden Analyse soll diejenige Intervention bestimmt werden, die den totalen Nutzen über den betrachteten Zeitraum am meisten steigert.

Formel (2) beschreibt die mathematische Formulierung des Optimierungsproblems.

$$Max. \sum_{a=1}^{A}(TN_a^{Max}) \cdot y_a \tag{4.2}$$

Wobei a die betrachtete Intervention ist und A die Gesamtanzahl an Interventionen die in betracht gezogen werden.

TB_a^{Max} ist der maximale totale Nutzen der generiert werden kann, wenn nur Intervention a durchgeführt wird.